Bureau of Energy Efficiency

सत्यमेव जयते
Government of India
Ministry of Power

german cooperation
DEUTSCHE ZUSAMMENARBEIT

giz

ANGAN
Augmenting Nature by Green Affordable New-habitat

A Courtyard for Revolutionary Change in Building Energy Efficiency

An International Conference on Building Energy Efficiency

9th-11th September, 2019 | Hotel The LaLiT, New Delhi

Bureau of Energy Efficiency

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DEUTSCHE ZUSAMMENARBEIT

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THIS PRESENTATION WAS SHARED BY

Mr. Pramod Adlakha

Managing Director, Adlakha Associates Pvt. Ltd. & Adlakha Affordable Homes

FOR THE SESSION:

"Emerging Construction Practices & Technologies"

DURING ANGAN 2019

Knowledge Partner

teri THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

Event Partner

TEC INDIA

International Conference and Exhibition on Building Energy Efficiency

Augmenting Nature by Green Affordable New-Habitat (ANGAN)

Emerging Energy-Efficient Intermediate Construction Technologies

PRAMOD ADLAKHA

Managing Director

- **Adlakha Associates Pvt. Ltd**
- **Adlakha Affordable Homes LLP**

Email: adlakhaoffice@gmail.com

10 September 2019
New Delhi, India

Technology Selection Parameters

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

- Cost effectiveness
- Compatible to Architecture
- Simple to understand
- Ease of construction
- Study & durable
- Energy conscious
- Security, safety
- Ease of maintenance
- Optimisation of material strength
- Conservation of natural resources
- Conservation of cement & steel
- Conservation of energy
- Employment generation, skill development
- Quality off-site & on-site
- Availability

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

ISSUES

(Brick and Mortar + Conventional In-Situ-Technology)

- Quality
- Time
- Labour intensive
- Supervision
- Non-skill agriculture labour

TRANSFORMING INDIA

• From Brick and mortar	to block w/o mortar
• From CIT	to on-site Prefabrication
• Transition from manual	to mechanisation (Quality & productivity)

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

Western Criteria of Technology Acceptance

- Focus on only thermal insulation of cold weather abroad.
- Focus on housing for one generation

Indian Criteria of technology acceptance

- Cost Affordability
- Life styles & comforts are not equivalent to western countries
- Focus on life of building for generations
- In the name of Technology Innovation we have forgotten our own “Make in India” and “Made for India” Technologies in the Building Industry.
- TAC Approvals and BIS Codes, CPWD are oriented towards specifications and not the “cost or performance”
- Western Technologies are based on principles of Heating & Cooling, with higher comfort levels than required for EWS and LIG in India

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

CONCEPT OF APPROPRIATE TECHNOLOGIES FOR AFFORDABLE HOUSING

LEVEL of TECHNOLOGIES

- **Low & traditional**
- **Intermediate**
- **Hi-Tech**

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

- Fly ash bricks (Fal-G)
- Perforated mechanised clay bricks
- Modular bricks
- Compressed stabilised soil bricks (CEB)
- Hollow concrete blocks (CMU)
- Reinforced HCB
- AAC Blocks
- CLC Blocks
- Stone block masonry
- Interlocking blocks
- Light weight poly concrete panels
- Bonds :
    - Rat-trap bond
    - 190 mm stretcher bond
    - Zig-zag bond
    - Cavity wall
    - Confined masonry

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

- Filler slab, RBC
- Hollow ‘Kulars’ slab
- Precast RB Panel
- Precast Brick Arch. Panel
- Precast funicular shell
- Precast channel
- Precast RC planks and joists
- Thin RC Ribbed slab
- L-panels
- Precast Ferro-crete panels
- Monolithic shear wall
- MCR tiles
- Vernacular – Vaults, corbel, pyramid, arched, semi arched

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

- Under reamed piles
- Arched foundations
- Strip floating foundations
- Ferro-cement Technology
    - Steps
    - Boundary wall
    - Water tank
    - Sunshade
    - Kitchen working platform
    - Window shutters
    - Concrete D/W frames

- Precast Large Concrete Panel System (PLCP)
- RCC Shear wall System
- Precast Glass Fibre Reinforced Gypsum System (GFRG) also called Rapid Panels
- Light Gauge Steel Framed (LGSF)
- MODUCAST, Precast Concrete Box System
- EPS Core Precast Wall Panels
- Waffle Crete System
- Pre-stressed Hollow Core Panels
- Expanded Steel mesh panel system
- Tunnel Form Technology
- Speed floor Technology
- Reinforced EPS core panel system
- LGSFS-ICP Technology
- Prefabricated fibre reinforced sandwich panels
- Rising EPS (beads) cement panels
- Concrewall system
- 3S System
- Insulating concrete form blocks walling

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

EWS HOUSING - YEAR 2006

RAJIV GANDHI HOUSING, BAWANA - 3164 HOUSES

TECHNOLOGIES

Roofing
Precast RC planks & joists roofing
Precast ferrocement elements

Walling
Perforated mechanized modular bricks
FAL-G modular bricks

Other Components
Single stack system of plumbing

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

EWS HOUSING - YEAR 2008
BAWANA, DELHI -1184 HOUSES

TECHNOLOGIES

- **Modular perforated Brick Walls**
- **Precast RC Planks & Joists Slab**
- **Precast Ferrocement Elements**

PRAMOD ADLAKHA
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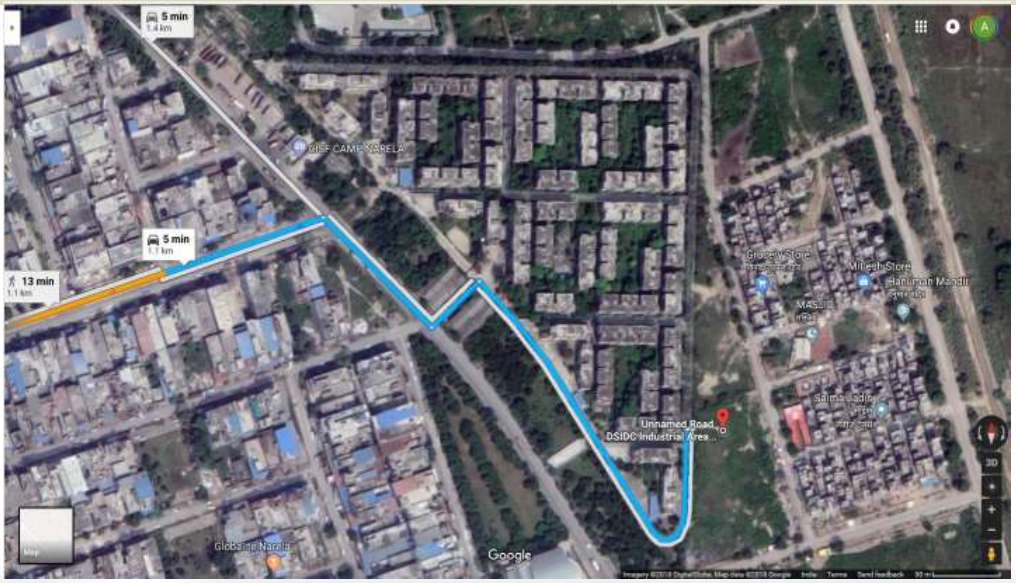
EWS HOUSING - YEAR 2006
NARELA, DELHI - 1892 HOUSES



TECHNOLOGIES

- **Modular perforated Brick Walls**
- **Precast RC Planks & Joists Slab**
- **Precast Ferrocement Elements**

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

EWS HOUSING - YEAR 2009
NARELA (NEAR CETP), DELHI, 1652 HOUSES

TECHNOLOGIES

- **Modular perforated Brick Walls**
- **Precast RC Planks & Joists**

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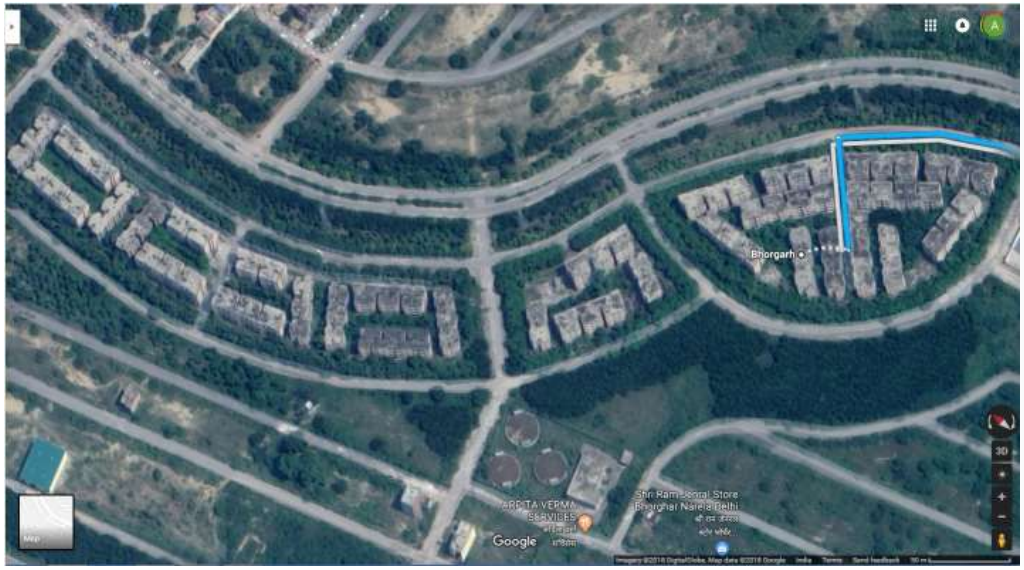
ADLAKHA ASSOCIATES PVT. LTD

HOUSING FOR URBAN POOR – YEAR 2011
BHORGARH, DELHI, 1272 HOUSES

TECHNOLOGIES

- **Modular perforated Brick Walls**
- **Precast RC Planks & Joists Slab**
- **Precast Ferrocement Elements**



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EWS HOUSING - YEAR 2010
BAPROLA, DELHI, 5568 HOUSES

TECHNOLOGIES

- **Modular perforated Brick Walls**
- **Precast RC Planks & Joists Slab**
- **Precast Ferrocement Elements**

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ADLAKHA ASSOCIATES PVT. LTD

EWS HOUSING - YEAR 2008
BAWANA, DELHI – 896 HOUSES

TECHNOLOGIES

Monolithic technology

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EWS HOUSING – YEAR 2016
BAKARWALA, DELHI – 240 HOUSES

TECHNOLOGIES

- **Mechanized bricks**
- **Flyash bricks**
- **Precast R.C. Planks and Joists Roof**

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EWS HOUSING

POOTHKHURD , DELHI - 10140 HOUSES

TECHNOLOGIES

- **RC Planks & Joists Roof In framed structure**
- **Flyash brick walls**

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EWS HOUSING
KALKAJI, DELHI - 3024 HOUSES

TECHNOLOGIES

- **Waling - CLC Blocks**

Google View

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ADLAKHA ASSOCIATES PVT. LTD

EWS HOUSING

FARIDABAD & PALWAL (ERA GROUP) - 578 HOUSES

TECHNOLOGIES

- **Modular perforated bricks**
- **Precast RC Planks & Joists Roof**

Era Adel Divine, Era Divine Court, Era Redwood Residency

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EWS HOUSING

SUSHANT GOLF CITY, LUCKNOW

2750 HOUSES

TECHNOLOGY :- Monolithic RCC

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EWS HOUSING

ASHRRAY, SULABH AWSAS YOJANA, LUCKNOW
4500 HOUSES

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EWS HOUSING - YEAR 2009
GHOGHA, DELHI – 3680 HOUSES

TECHNOLOGY :- **Monolithic RCC**

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EWS HOUSING - ONGOING
TIKRI KALA, DELHI – 4560 HOUSES

TECHNOLOGIES

- **RC Planks & Joists Roof In framed structure**
- **Flyash brick walls**

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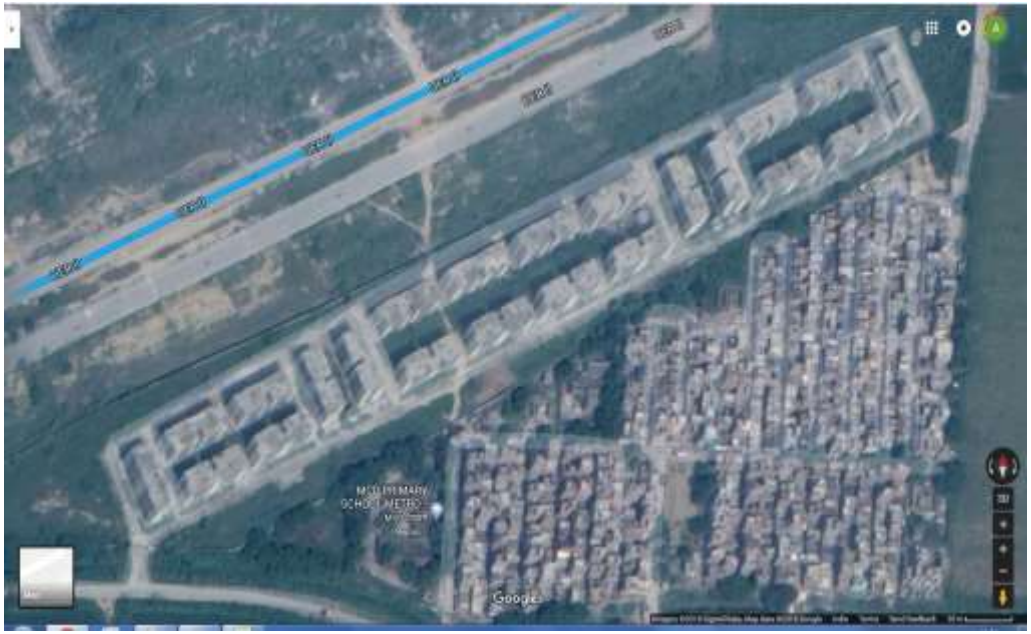
ADLAKHA ASSOCIATES PVT. LTD

EWS HOUSING - YEAR 2013
BAWANA, DELHI – 704 HOUSES

TECHNOLOGY

Monolithic Technology



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EWS HOUSING - YEAR 2010
OMICRON, GREATER NOIDA, 1848 HOUSES

TECHNOLOGIES

- **Modular perforated Brick Walls**
- **Precast RC Planks & Joists Slab**
- **Precast Ferrocement Elements**

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LIG AFFORDABLE HOUSING

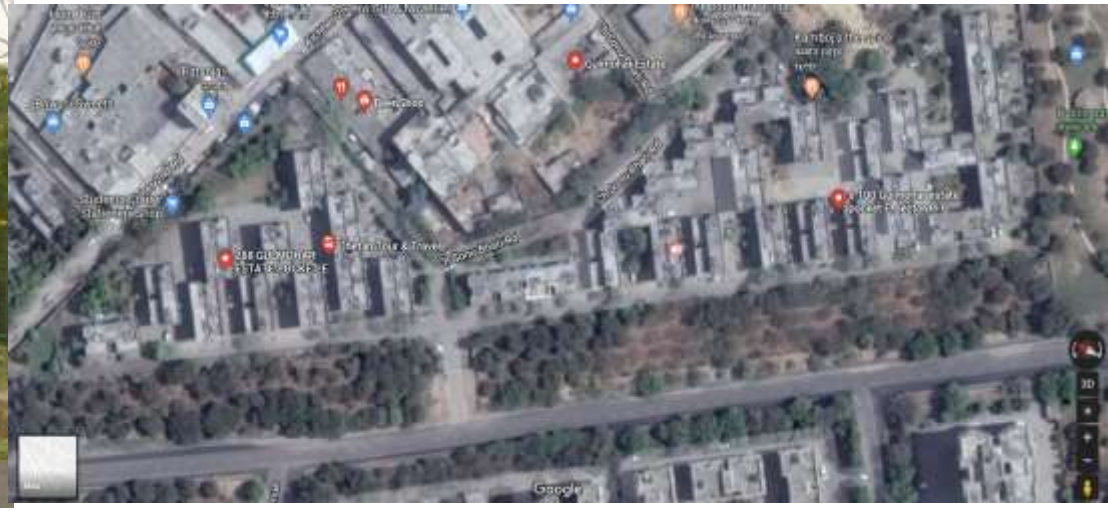
GREATER NOIDA - 800 HOUSES

Cassia Estate

TECHNOLOGIES

Walls :- Rat Trap Bond

Gulmohar Estate



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AFFORDABLE HOUSING - ONGOING

DELHI POLICE HOUSING, DHEERPUR, DELHI - 5202

TECHNOLOGY

Projects using Monolithic Technology

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AFFORDABLE HOUSING - YEAR 2013

INNO GEOCITY, CHENNAI - 500 HOUSES

TECHNOLOGIES

- **Hydraform interlocking block walls**
- **Precast RC Planks & Joists Roof**
- **Stone Block masonry in foundation**
- **Precast Boundary wall**

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Under reamed piles

Under reamed piles

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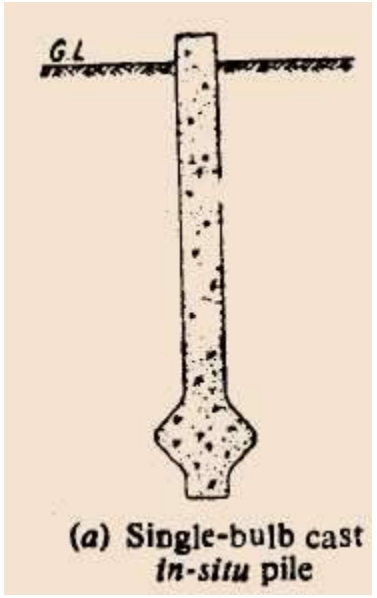
CASTING THROUGH TREME

AUGUR BORING IN PROGRESS

REINFORCEMENT CAGE IN PILE



(a) Single-bulb cast *in-situ* pile

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Modular perforated mechanized Bricks

Modular perforated mechanized Bricks

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Modular perforated mechanized BrICKS

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Modular perforated mechanized BrICKS

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Project – EWS Housing at Bawana, Delhi

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Modular fly-ash bricks

dular fly-ash bricks

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AAC block walls

AAC block walls

Project: EWS housing, for DDA, at Kalkaji

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Monolithic technology

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Laying RCC strip foundation with dowel bars and wall reinforcement

Form work for Walls below plinth

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External wall
corner Formwork

Internal Walls &
Ceiling Form work

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Form work & Reinforcement for slab ready for casting along with the walls

Casting of Staircase Monolithically

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Ceiling view after removal of Formwork

External wall formwork for
First Floor structure

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another view of external wall formwork for first floor structure

External wall Formwork for Second Floor

Monolithic technology

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Multistoreyed Building under Construction with Monolithic Technology in Mumbai

View of multi-storeyed building at Lucknow

Multistoreyed building in Progress

Monolithic technology

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View of completed building at Delhi

CASE STUDY

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RAJIV GANDHI HOUSING, BAWANA, 3164 HOUSES

- ✓ The FIRST Mass Housing scheme with cost effective alternative technologies.
- ✓ The LARGEST Industrial Workers Housing scheme in organized sector in Asia.
- ✓ The FIRST Housing Project to use fly ash and fly ash products on a large scale.
- ✓ The FIRST Mass housing Scheme with mechanized perforated modular bricks
- ✓ The FIRST Housing Scheme with largest number of precast concrete and ferrocement elements (approx. 4 lacs elements)
- ✓ The FIRST Low Cost housing ISO-9001 Certified project.

RECOGNITION BY Ministry of Housing, Govt. of India & Govt. of NCDT, Delhi

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FAÇADE IN PRAGATI MAIDAN “DELHI PAVILION” MADE TO REPRESENT “RAJIV GANDHI HOUSING PROJECT”

RECOGNITION BY Ministry of Housing, Govt. of India & Govt. of NCDT, Delhi

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DEMONSTRATING COST EFFECTIVE TECHNOLOGIES (A CASE STUDY OF BAWANA INDUSTRIAL WORKERS HOUSING PROJECT)

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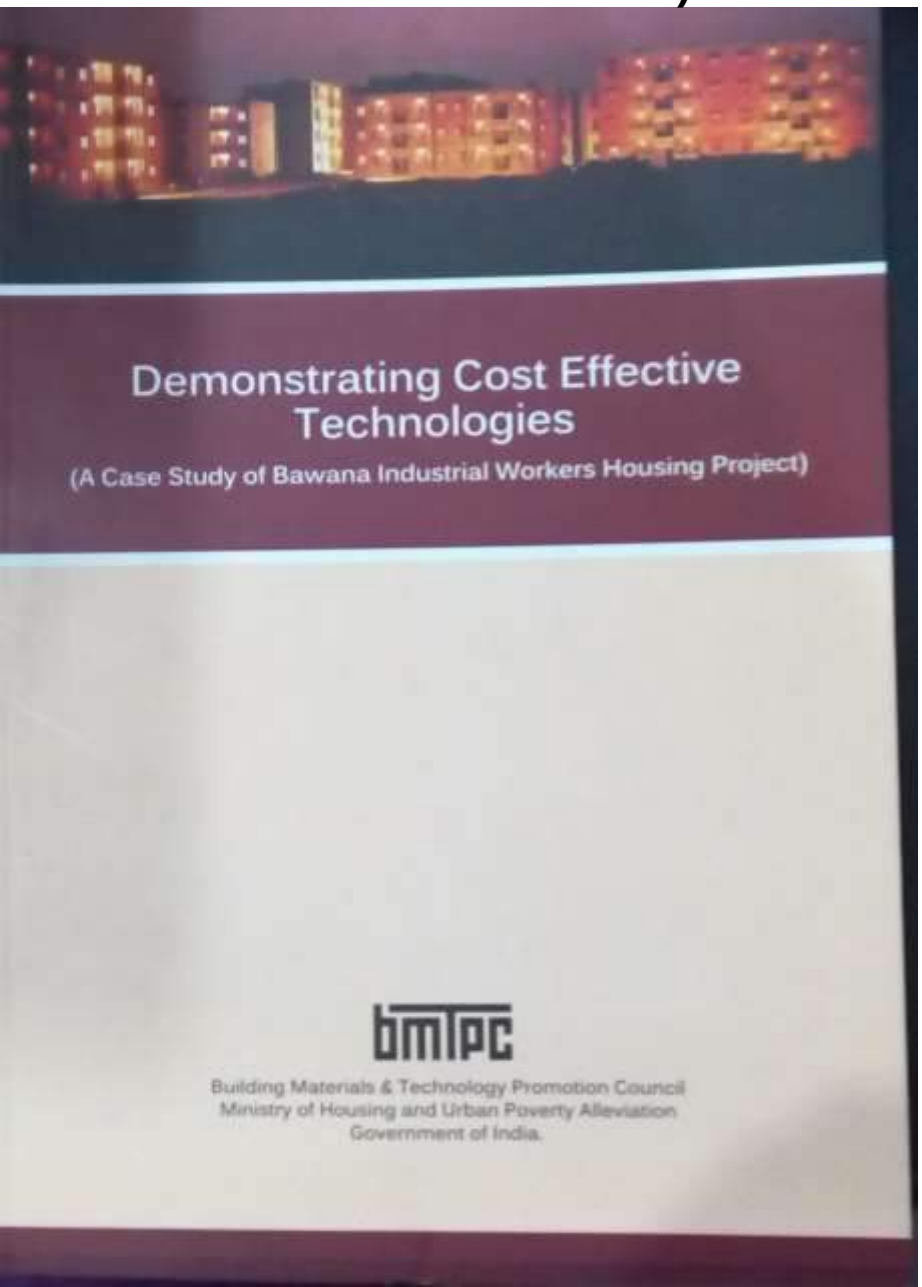

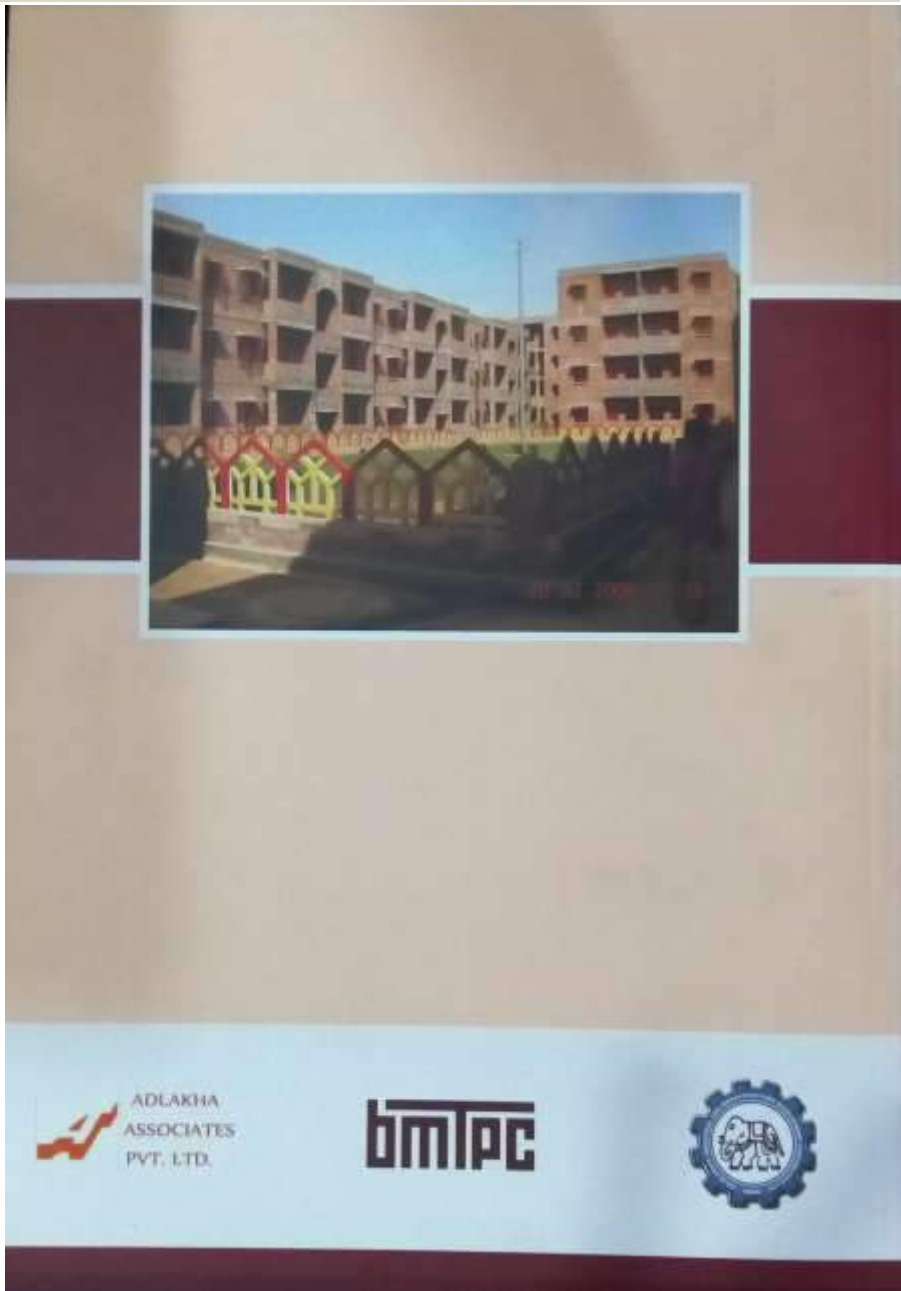

GOOGLE VIEWS

RAJIV GANDHI HOUSING, BAWANA, 3164 HOUSES

PRAMOD ADLAKHA
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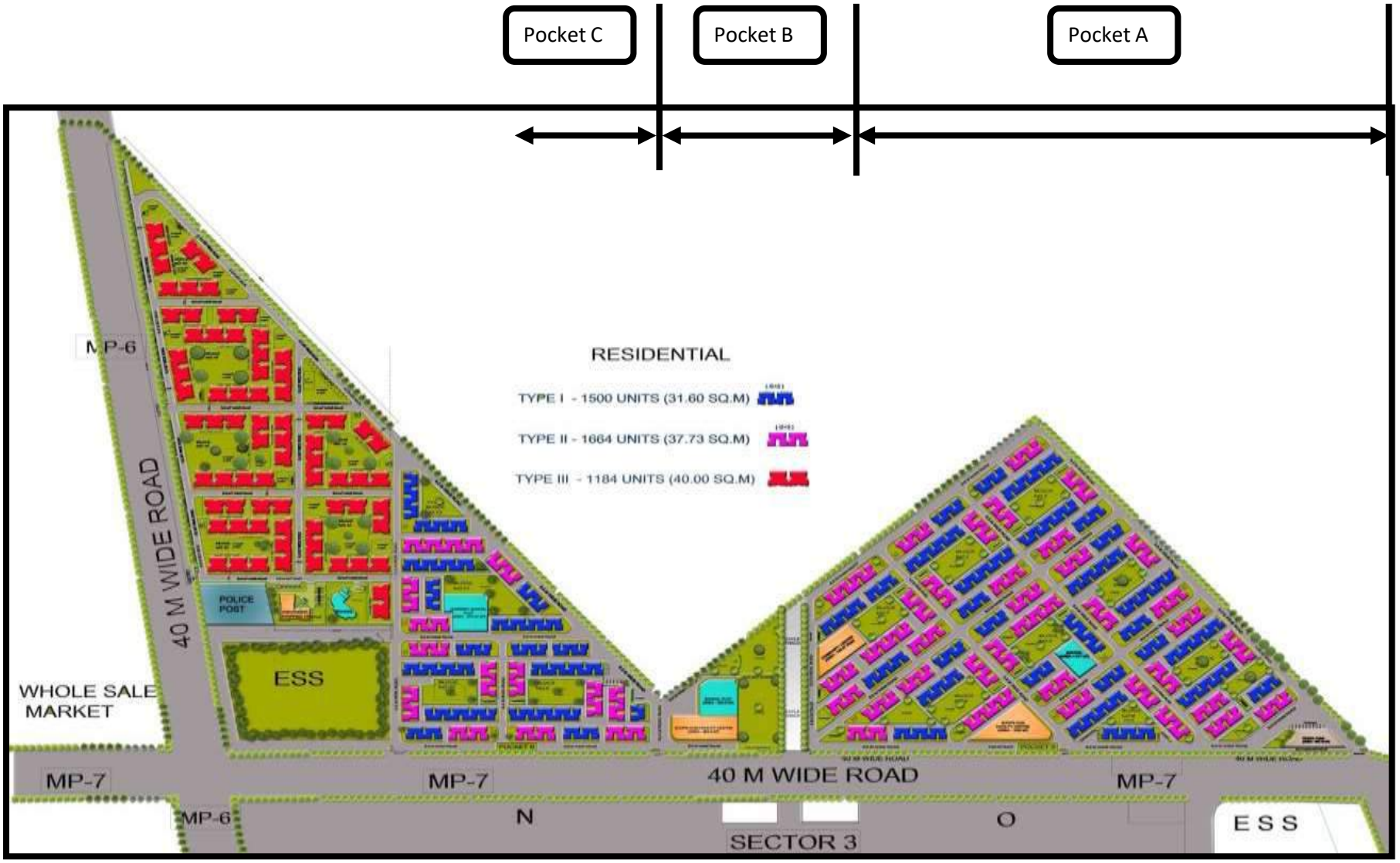
Pocket C
Pocket B
Pocket A
RESIDENTIAL
TYPE I - 1500 UNITS (31.60 SQ.M)
TYPE II - 1664 UNITS (37.73 SQ.M)
TYPE III - 1184 UNITS (40.00 SQ.M)
MP-6
40 M WIDE ROAD
POLICE POST
ESS
WHOLE SALE MARKET
MP-7
MP-7
40 M WIDE ROAD
MP-7
MP-6
N
O
SECTOR 3
ESS

- **Layout Plan**

- **Space Visualization**

Fig. 1 – Pile Casting through a Tremie

Fig. 2 – Reinforcement Cage in Under-ream Borehole

Fig. 3

Fig. 4

Casting of Under-reamed Piles in Progress

Grade Beam & Vertical Reinforcement (for Earthquake Resistance)

Plinth band & Vertical Reinforcement (for Earthquake Resistance)

Photograph of lintel band

Photograph of roof band

Vertical Reinforcement L - Junction

Vertical Reinforcement T - Junction

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R.C. PLANKS & JOISTS

R.C. PLANKS AND JOISTS SLAB

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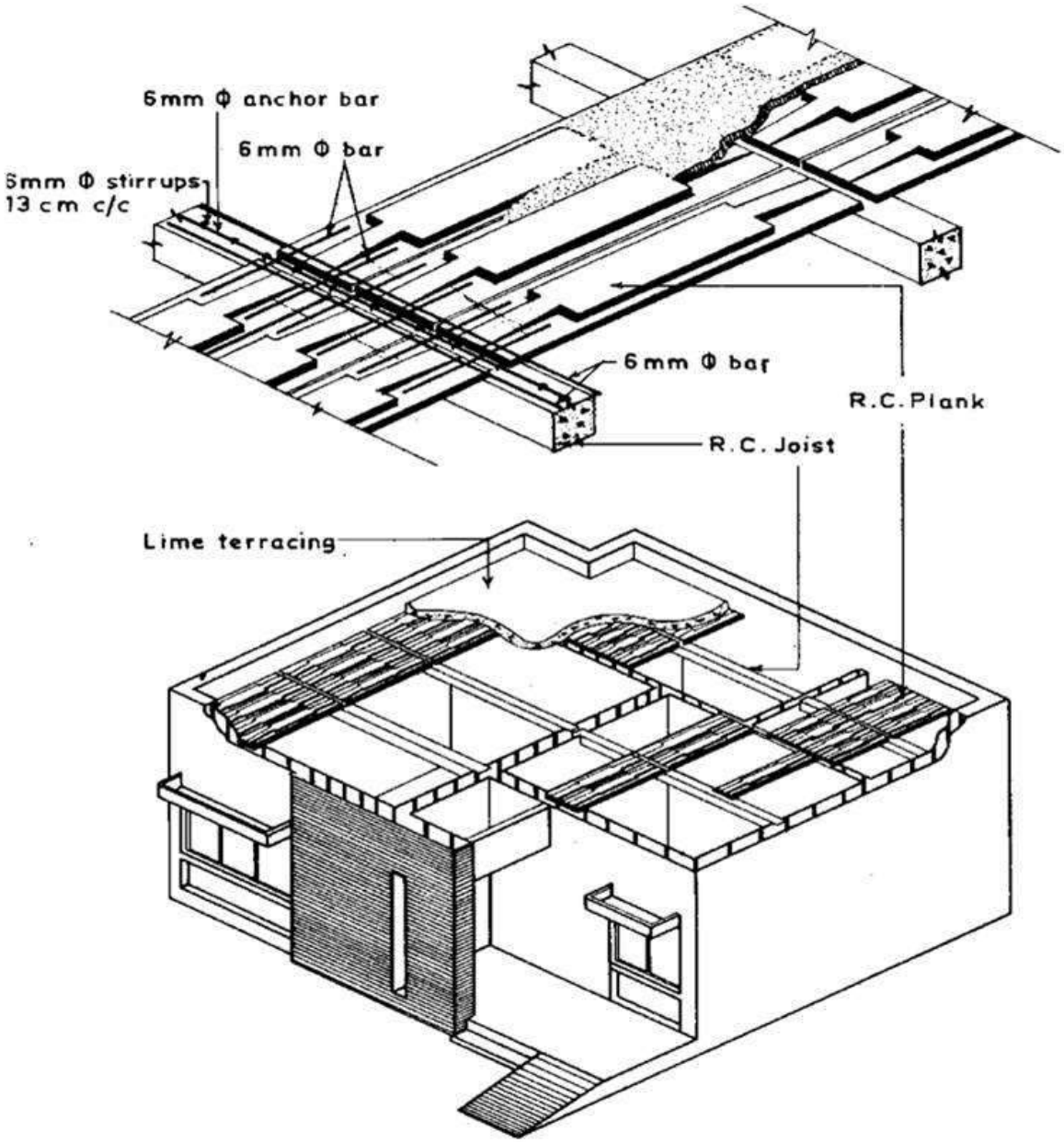

The plank and joist technology consists of 60mm thick specifically designed precast planks supported over precast joists.

Cast in situ concrete is poured over the slab forming a monolithic structure.

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Step 1: Preparation and collection of materials

Reinforcement mesh in planks

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Step 1: Preparation and collection of materials

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PLANK MAKING MACHINES

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Step 2: Preparing the machine for casting of planks

The precast plank machine

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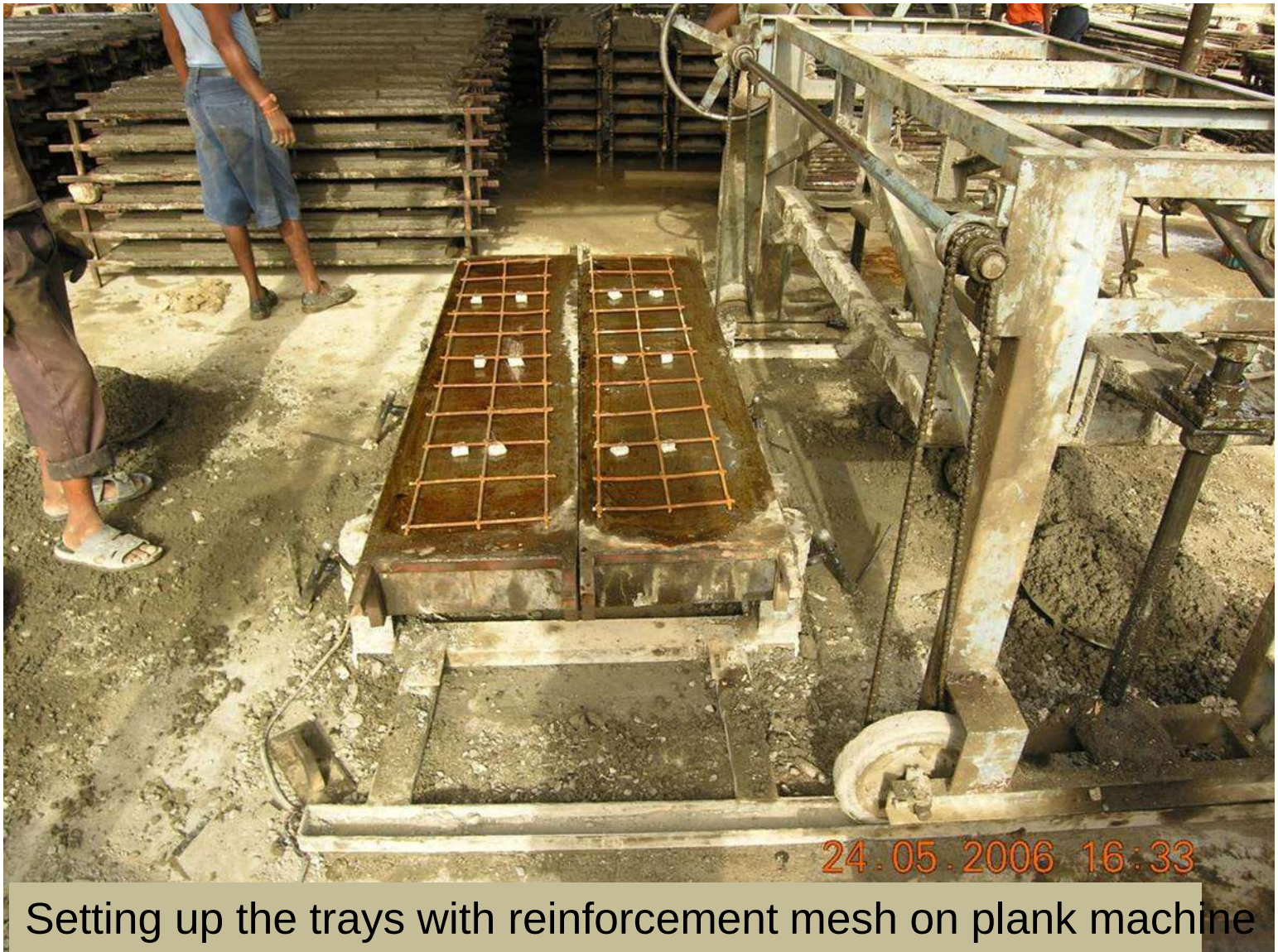
ADLAKHA ASSOCIATES PVT. LTD

Step 2: Preparing the machine for casting of planks



Setting up the trays with reinforcement mesh on plank machine

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ADLAKHA ASSOCIATES PVT. LTD

Step 2: Preparing the machine for casting of planks

Setting up the trays with reinforcement mesh on plank machine

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Step 2: Preparing the machine for casting of planks

Locking the mould in position over the trays.

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Step 2: Preparing the machine for casting of planks

Locking the mould in position over the trays.

PRAMOD ADLAKHA
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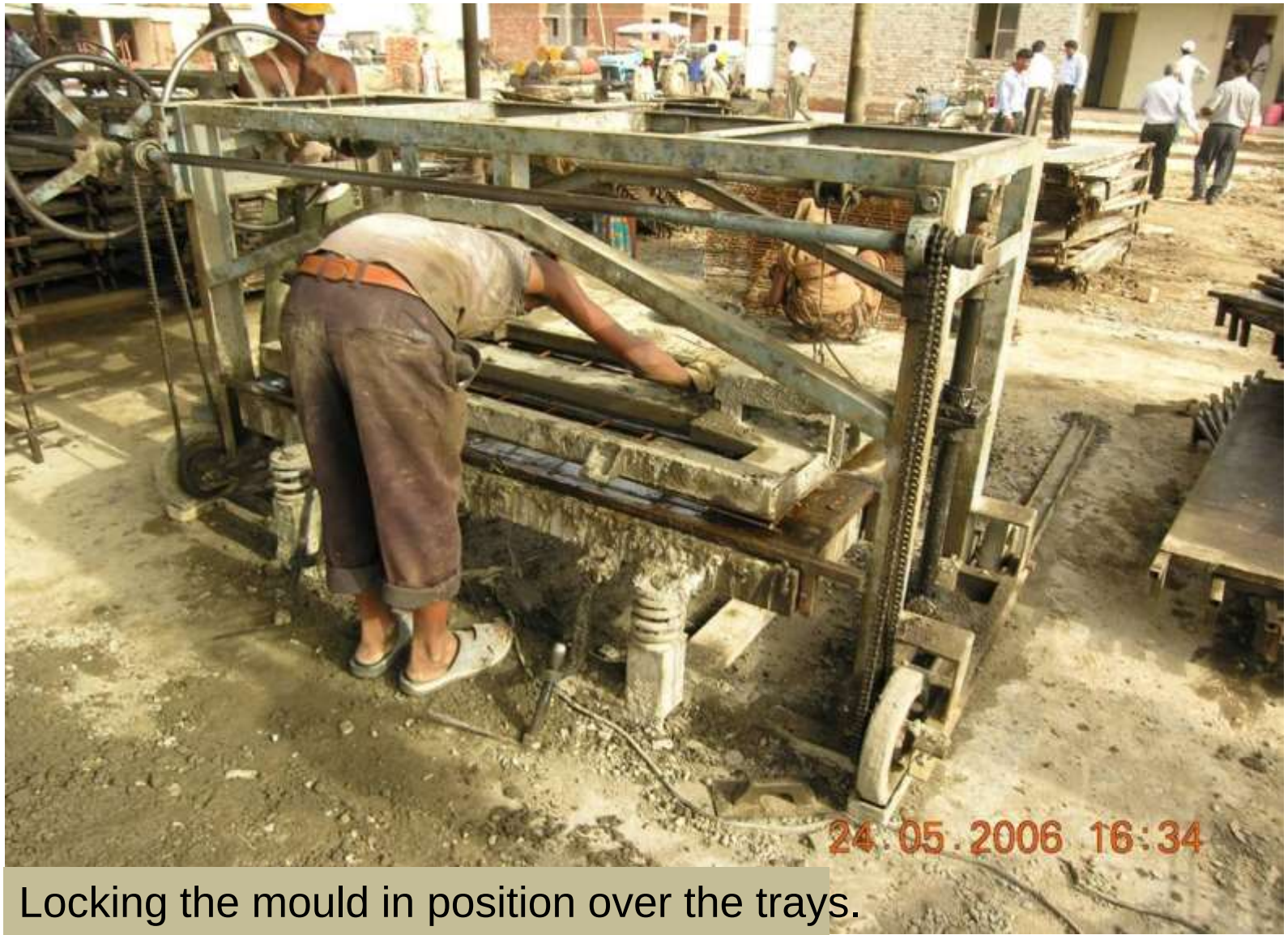
Step 2: Preparing the machine for casting of planks



Locking the mould in position over the trays.

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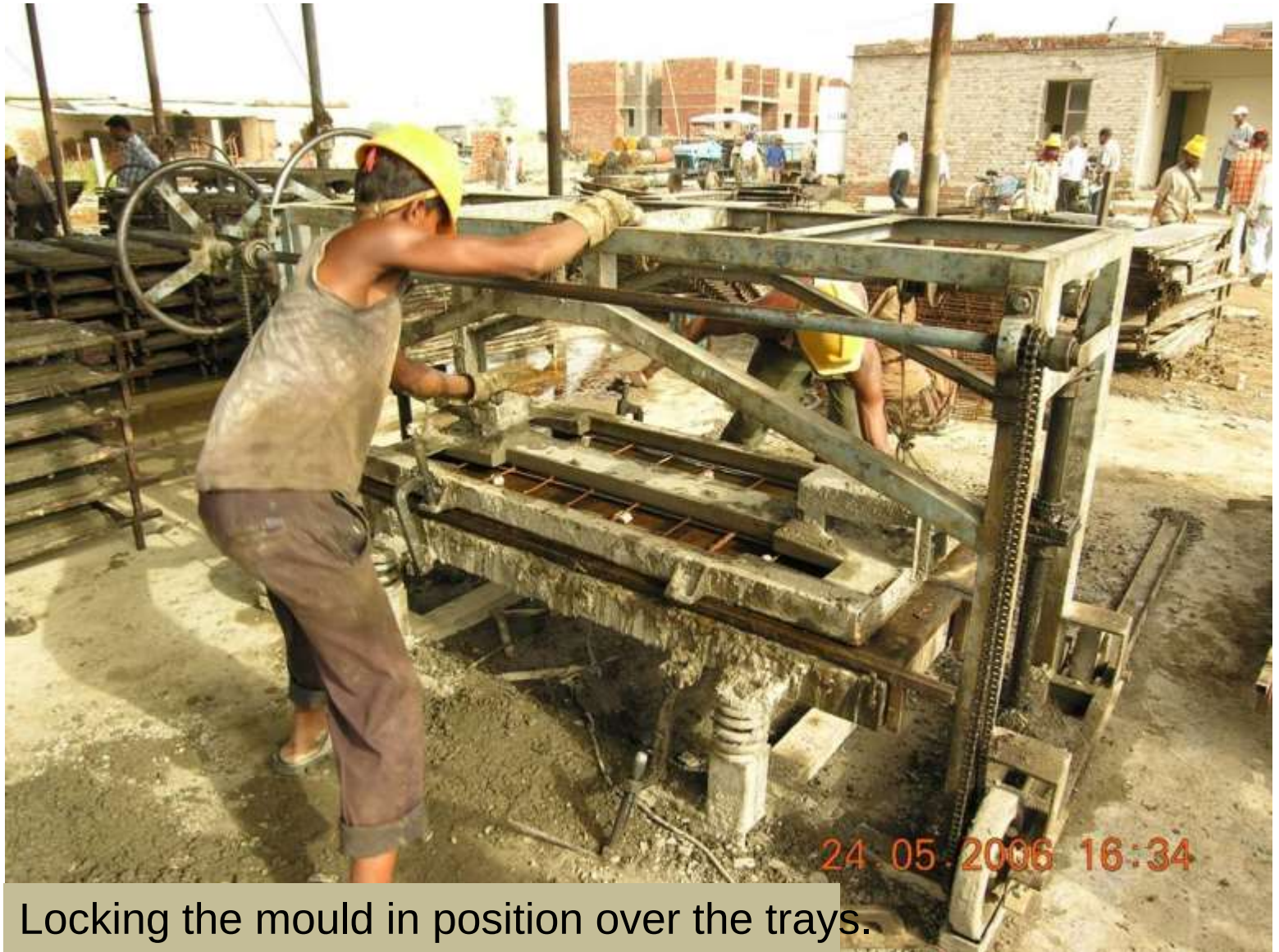
Step 2: Preparing the machine for casting of planks



Locking the mould in position over the trays.

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Step 3: Casting of precast planks

Pouring in concrete over the mould.

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Step 3: Casting of precast planks

Pouring in concrete over the mould.

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Step 3: Casting of precast planks

Filling of concrete in the mould.

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Step 4: Process of disassembly of planks

Unlocking the mould.

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Step 4: Process of disassembly of planks

Unlocking the mould.

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Step 4: Process of disassembly of planks

Unlocking the mould.

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Step 4: Process of disassembly of planks

Casted planks are ready.

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Step 5: Stacking and curing of planks

Stacked planks.

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Step 5: Stacking and curing of planks

Curing complete. Stacking yard of planks.

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Step 7: Casting of joists

Mould preparation for joists using channels.

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Step 7: Casting of joists

Casting joists in moulds.

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Step 8: Stacking and curing of joists

Curing of casted joists.

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Step 9: Placing joists on floor slab

Lifting joists to be taken to construction site.

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Step 9: Placing joists on floor slab

Transporting joists to construction site.

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Step 9: Placing joists on floor slab

Transporting joists to construction site.

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Step 9: Placing joists on floor slab

Transporting joists to construction site.

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Step 10: Placing planks on the floor slab

Planks taken away from yard to the construction site.

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Step 10: Placing planks on the floor slab

Lifting and placement
of planks on roof using a crane.

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Step 10: Placing planks on the floor slab

Crane for lifting of planks.

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Step 11: Negative reinforcements over planks

Negative reinforcements in haunches of planks.

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Step 11: Negative reinforcements over planks

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Negative reinforcements in haunches of planks.

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Step 12: Pouring cast in situ concrete

Pouring cast in situ concrete over planks.

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Step 12: Pouring cast in situ concrete

Leveling the cast in situ concrete.

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Completed slab

R.C. PLANKS AND JOISTS SLAB

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

VIEW OF CEILING.
JOINTS ARE FINISHED WITH POINTING/POP.
NO NEED FOR CEILING PLASTER.

QUALITY ASSURANCE
R.C PLANK LOAD TEST

PRAMOD ADLAKHA
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R.C. PLANK LOAD TEST

QUALITY ASSURANCE
R.C PLANK LOAD TEST

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MOCK ASSEMBLY TEST

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

FERRO-CEMENT

PRECAST FERRO-CEMENT

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

HOW IS THIS TECHNOLOGY ENERGY EFFICIENT:

- Thin element, saves cement
- Saves shuttering
- Casted at site, no external transportation
- Less water consumption

PRECAST FERRO-CEMENT

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

Precast
Ferro-cement
steps

PRECAST FERRO-CEMENT

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

Precast
Ferro-cement
steps

PRECAST FERRO-CEMENT

Precast ferrocement sunshades

PRECAST FERRO-CEMENT

PRAMOD ADLAKHA
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Precast Ferro-cement

Precast ferro-cement Kitchen platform

Precast ferrocement water tank

ENERGY EFFICIENCY

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

- ✓ Reduction in consumption of
  - Bricks
  - Concrete
  - Cement
  - Sand
  - Steel reinforcement
- ✓ Elimination of ceiling plaster & external plaster
- ✓ Almost no shuttering/form work
- ✓ Reduction in internal wall plaster
- ✓ Perforated bricks/fly-ash bricks provide better insulation
- ✓ On site production – no outside transportation
- ✓ Low maintenance
- ✓ No heavy/large equipment required
- ✓ Less consumption means saving of embodied energy.

SAVINGS IN EMBODIED ENERGY

PRAMOD ADLAKHA
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Consumption of reinforcement steel

Cost effective housing: less than 1.0 kg per sq ft.

Conventional housing: 3 to 4 kg per sq ft.

STEEL
Less than 1.0 kg per sq ft

Consumption of cement

Cost effective housing: 0.25 BAGS per sq ft.

Conventional housing: 0.45 BAGS per sq ft.

CEMENT
Less than 0.25 bags per sq ft

Thus, savings in
- ✓ Resource Material
- ✓ Embodied energy
- ✓ CO2

Case examples were taken of each housing block from 4 of our projects (ie. Bawana, Baprola, Bhorgarh and Narela) and estimates were prepared using one example of a conventional technology and one using precast systems.

ENERGY EFFICIENT

WATER CONSERVATION

PRAMOD ADLAKHA
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- ✓ During construction – due to less volume of masonry, concrete, no ceiling plaster, no external plaster.
- ✓ The precast slab panels, stairs, sunshades, shelves (thin elements) cured with spray of water.
- ✓ The mechanised bricks & high strength blocks, have high compressive strength and low water absorption.
- ✓ Ferrocement elements being thin elements – consume less water.
- ✓ Hardy plants species used which require less water (Acacia Arabica, Baryan, Pelpal, Ashok, Cedar etc)

AFFORDABILITY IN TECHNOLOGY
COMPARISON CHART – SAVINGS IN COST

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Item	Conventional	Alternative technology used	Advantages	Savings In Cost
Foundations	Isolated and step footings	Under-reamed piles In load bearing Structure	Economical as well as speedy construction	10%
Walls	230 mm Brick wall in English bond (using conventional FPS, Clay Bricks)	200 mm thick brick wall in Flemish bond (using machine made modular perforated bricks)	• Reduction in wall thickness due to high strength bricks • No plaster on external faces • Heat & Sound resistance	20%
Intermediate floors & roof	Cast-in-situ RCC slab	Precast RC Plank system	• Saving in cement, Steel & shuttering • Cost effective (no Plaster required) • Controlled conditions • Speedy construction • Better finishes & Aesthetics	21%
Stair case	Cast-in-situ RCC joist slab	Precast ferrocement steps 25 mm thick (tread & riser unit)		30%
Sunshades Cum Lintels	Cast-in-situ RCC slab	Precast RC		25%
Kitchen Platforms	Cast-in-situ RCC slab	Precast ferrocement 25 mm thick		30%
Water Tanks	RCC, PVC	Ferrocement		20%

Table 3: Perceived Indoor Environmental Conditions

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Cross tabulation of householder responses on perception of indoor temperature, air quality and air movement with their corresponding response for overall experience DURING SUMMER

Perceived indoor temperature in summer	Unsatisfactory	Bearable	Satisfactory	Row total
Unsatisfactory	45	11	0	56
Bearable	4	64	5	73
Satisfactory	0	6	13	19
Column total	49	81	18	148
Perceived indoor air quality in summer				
Stuffy	43	24	1	68
Bearable	6	54	13	73
Fresh	0	3	4	7
Column total	49	81	18	148
Perceived indoor air movement in summer				
Draughty dw (door & window)	1	1	0	2
Still	24	31	4	59
Well-ventilated	24	49	14	87
Column total	49	81	18	148

Table 4: Perceived Indoor Environmental Conditions

PRAMOD ADLAKHA
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Cross tabulation of householders' responses for their perception of indoor temperature, air quality and air movement with their corresponding response for overall experience DURING WINTER

Perceived indoor temperature in winter	Unsatisfactory	Bearable	Satisfactory	Row total
Unsatisfactory	12	7	1	20
Bearable	4	85	5	94
Satisfactory	0	8	24	32
Column total	16	100	30	146
Perceived indoor air quality in winter				
Stuffy	9	15	1	25
Bearable	6	84	22	112
Fresh	1	1	7	9
Column total	16	100	30	146
Perceived indoor air movement in Winter				
Draughty dw (door & window)	6	24	0	30
Still	6	43	10	59
Well-ventilated	4	33	20	57

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MORTAR-LESS INTERLOCKING BLOCK TECHNOLOGY

Project: InnoGeocity
Oragadam, Chennai

Project: Staff Workers housing
Anjar & Vapi, Gujrat

Project: Ministry of Animal Husbandry
Balabgarh, Faridabad

INTERLOCKING BLOCKS

INTERLOCKING CONSTRUCTION

PRAMOD ADLAKHA
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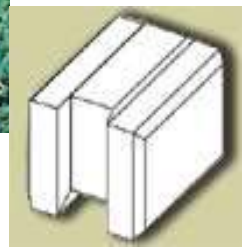
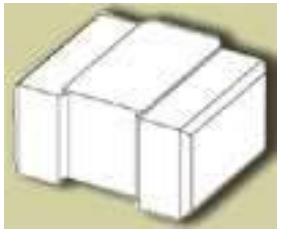
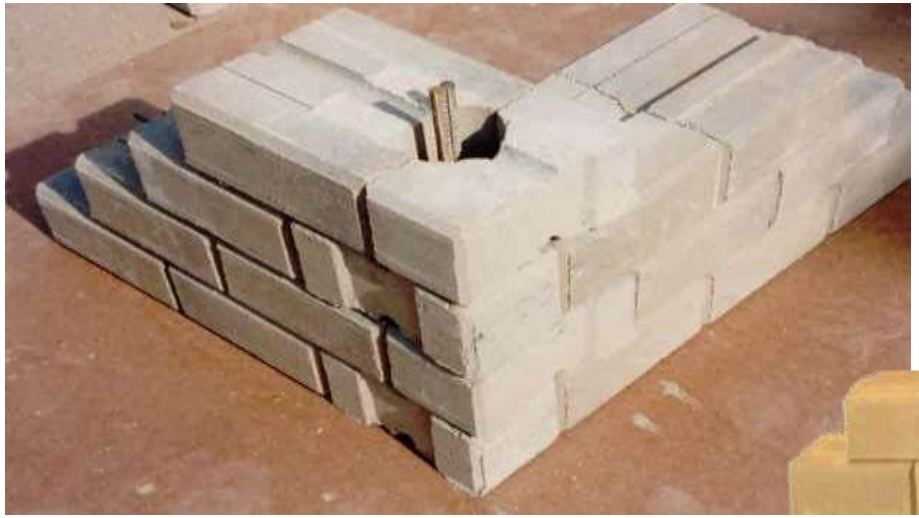
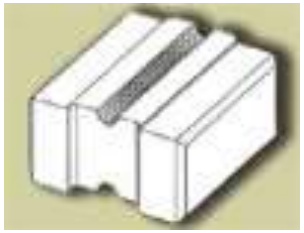
- An alternate to conventional bricks & mortar
- Male/Female Interlocking – Vertical / Horizontal Shear keys
- Suitable for Load/Framed Structures Compatible to incorporate V/H reinforcements
- Suitable for Seismic structures
- Speedier construction









INTERLOCKING BLOCKS

INTERLOCKING CONSTRUCTION

PRAMOD ADLAKHA
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HOW IS THIS TECHNOLOGY ENERGY EFFICIENT:

- Locally available resources used
  - Fly-Ash
- No burning – eco friendly
- No transportation – can be casted at site.

- Low embodied energy – minimal cement.
- No plaster - hence reduction in cement and CO2
- Reusable and recyclable blocks
- Thermally efficient
- Fast construction


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DOOR FRAMES & STAIRCASE

Actual Completed Building Photographs

HYDRAFORM INTERLOCKING BLOCKS

Project: InnoGeocity (Phase 1)
500 houses in Oragadam, Chennai, India

Owners: Inno Group Holdings
Architecture consultants:
Adlakha Associates Pvt. Ltd., India

Actual Completed Building Photographs

HYDRAFORM INTERLOCKING BLOCKS

Project: Staff Workers housing
Anjar & Vapi, Gujrat, India
(Technology used in Zone V earthquake zone)

Owner: M/S Welspun Group, India
Architecture consultants:
Adlakha Associates Pvt. Ltd., India

Actual Completed Building Photographs

HYDRAFORM INTERLOCKING BLOCKS

Project: Ministry of Animal Husbandry, Balabgarh, Faridabad, India

Architecture consultants: Adlakha Associates Pvt. Ltd., India

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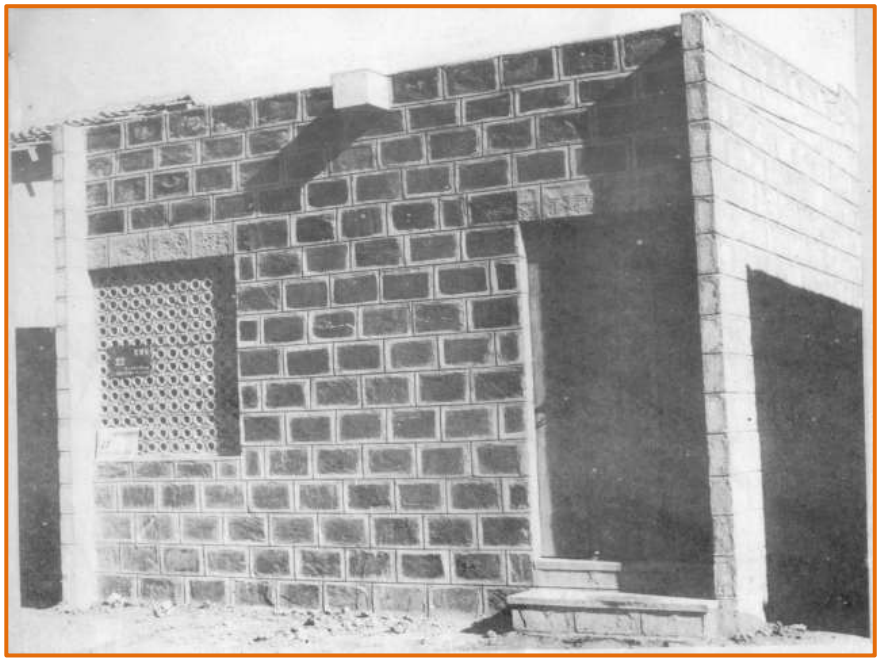
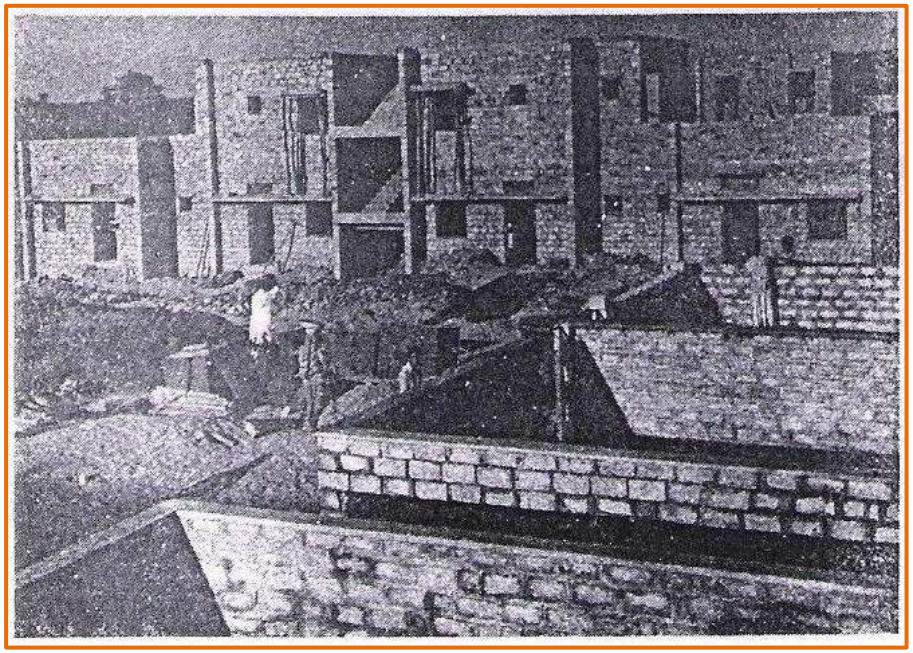
PRECAST STONE BLOCK MASONRY

Project: Staff Workers housing
Anjar & Vapi, Gujrat

Project: Staff housing, Bhopal





A Building in Housing Rajasthan With Stone Block Masonry

View of stone block masonry housing at Bhopal

Foundation at Vapi site with Concrete Blocks

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CASE STUDY
VERNACULAR TECHNOLOGIES

POETRY IN BRICKS,
Manesar

GOOGLE VIEW

PRAMOD ADLAKHA
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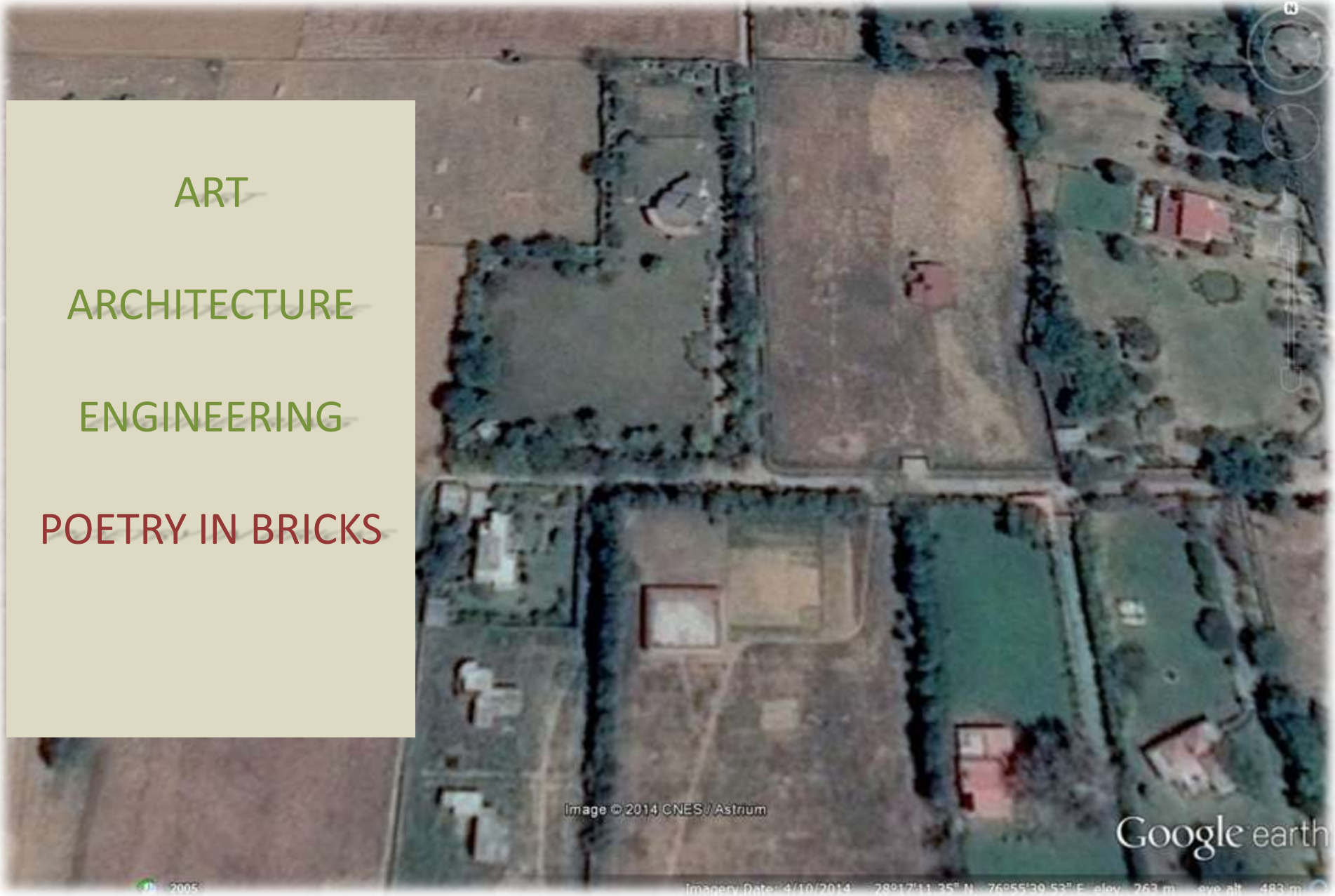
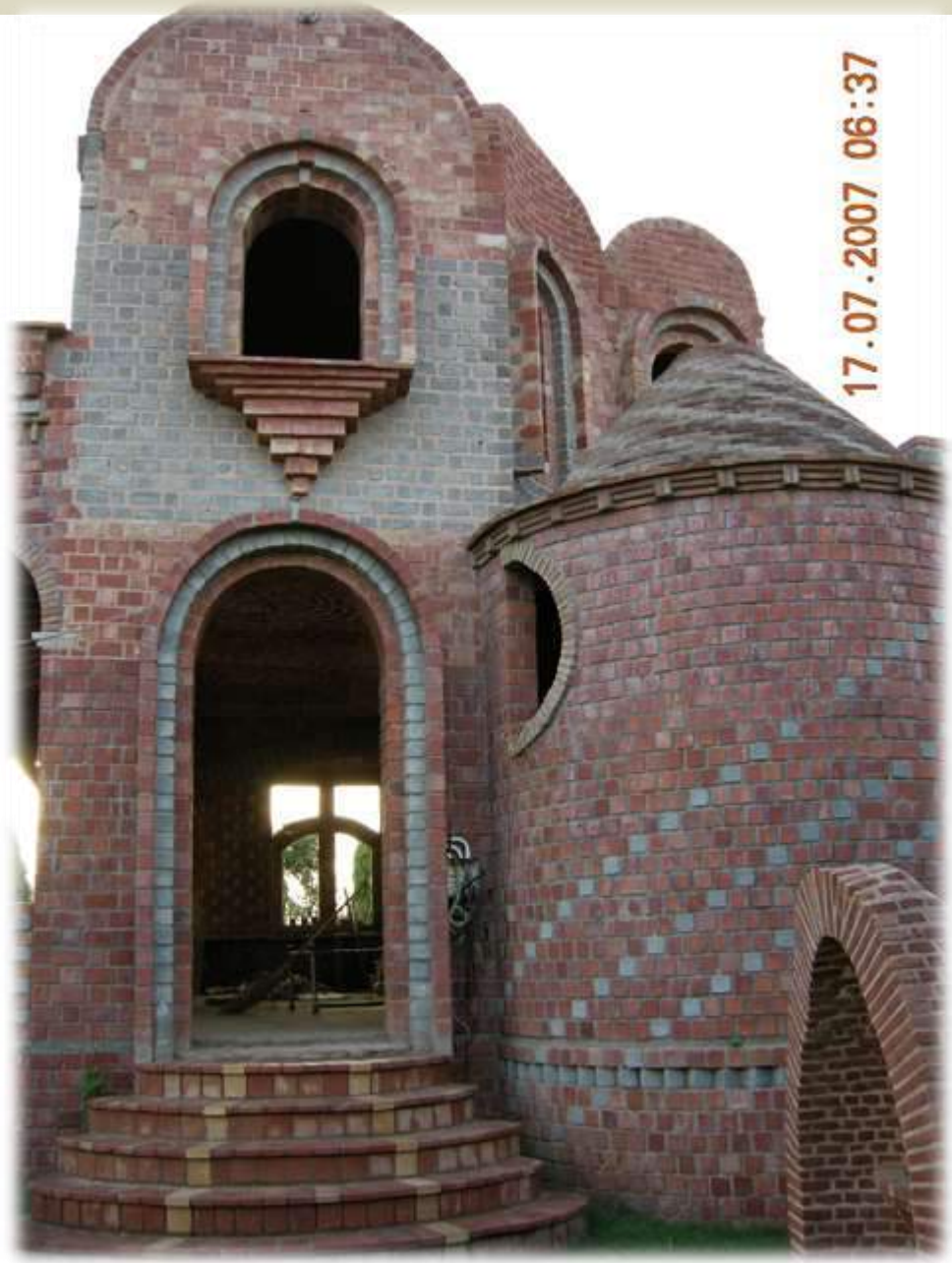


THE BUILT FORM

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD

THE BUILT FORM

PRAMOD ADLAKHA
ADLAKHA ASSOCIATES PVT. LTD



THE BUILT FORM

PRAMOD ADLAKHA
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THE BUILT FORM

INTERNAL VIEWS - CEILING

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INTERNAL VIEWS - CEILING

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INTERNAL VIEWS – FIRE PLACE

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INTERNAL VIEWS – ROOMS

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INTERNAL VIEWS – ROOMS

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FEATURED ELEMENT - STAIRCASE

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FEATURED ELEMENT - STEPS

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THE DRIVEWAY & ENTRANCE

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KITCHEN AND GARDEN

MORE PATTERNS IN BRICK

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MORE PATTERNS IN BRICK

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NIGHT VIEWS - interior

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NIGHT VIEWS - interior

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NIGHT VIEWS - interior

PRAMOD ADLAKHA
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NIGHT VIEWS - interior

PRAMOD ADLAKHA
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NIGHT VIEWS - outside

PRAMOD ADLAKHA
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NIGHT VIEWS - outside

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